99A-118

4.5 PSP Cover Sheet (Attach to the front of each proposal)

Proposal Title: Behavior of Anadromous Fishes at Passageways

Applicant Name: The Regents of the University of California

Mailing Address: Box 951406, 1401 Ueberroth
Los Angeles, Ca. 90095-1406

Telephone: (310) 825-0695

Fax: (310) 206-4996

Email: hdhillon@srnet.ucla.edu

Amount of funding requested: $ 350,770 for 3 years

Indicate the Topic for which you are applying (check only one box):

- ☒ Fish Passage/Fish Screens
- ☐ Habitat Restoration
- ☐ Local Watershed Stewardship
- ☐ Water Quality
- ☐ Introduced Species
- ☐ Fish Management/Hatchery
- ☐ Environmental Education

Does the proposal address a specified Focused Action? _____ yes ___X___no

What county or counties is the project located in? Sonoma and Sacramento

Indicate the geographic area of your proposal (check only one box):

- ☐ Sacramento River Mainstem
- ☒ Sacramento Trib:
- ☐ San Joaquin River Mainstem
- ☐ San Joaquin Trib:
- ☐ Delta:
- ☐ East Side Trib:
- ☐ Suisun Marsh and Bay
- ☐ North Bay/South Bay:
- ☐ Landscape (entire Bay-Delta watershed)
- ☐ Other:

Indicate the primary species which the proposal addresses (check all that apply):

- ☐ San Joaquin and East-side Delta tributaries fall-run chinook salmon
- ☐ Spring-run chinook salmon
- ☐ Fall-run chinook salmon
- ☐ Longfin smelt
- ☒ Steelhead trout
- ☐ Striped bass
- ☐ All chinook species
- ☐ All anadromous salmonids
- ☐ Winter-run chinook salmon
- ☐ Late-fall run chinook salmon
- ☐ Delta smelt
- ☐ Splittail
- ☐ Green sturgeon
- ☐ Migratory birds
- ☒ Other: White sturgeon

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I-013451

Specify the ERP strategic objective and target (s) that the project addresses. Include page numbers from January 1999 version of ERP Volume I and II:

Objective is to decrease the stress of dams and other structures on target species, steelhead trout and white sturgeon. Page numbers: Vol. I: 419, 424, 430, 433, 434; Vol. II: 165, 247,276,358,406

Indicate the type of applicant (check only one box):

☐	State agency	☐	Federal agency
☐	Public/Non-profit joint venture	☐	Non-profit
☐	Local government/district	☐	Private party
☒	University	☐	Other:

Indicate the type of project (check only one box):

☐	Planning	☐	Implementation
☐	Monitoring	☐	Education
☒	Research		

By signing below, the applicant declares the following:

1.) The truthfulness of all representations in their proposal;

2.) The individual signing the form is entitled to submit the application on behalf of the applicant (if the applicant is an entity or organization); and

3.) The person submitting the application has read and understood the conflict of interest and confidentiality discussion in the PSP (Section 2.4) and waives any and all rights to privacy and confidentiality of the proposal on behalf of the applicant, to the extent as provided in the Section.

The Regents of the University of California
Printed name of applicant

Signature of applicant Hardy Dhillon
Contract and Grant Officer

I-013452

Title Page

BEHAVIOR OF ANADROMOUS FISHES AT PASSAGEWAYS .

Contact: Prof. Malcolm S. Gordon

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Box 951606

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Consultant: Prof. Joseph J. Cech, Department of Wildlife, Fish, and Conservation Biology

University of California, Davis

Type of organization: State controlled institution of higher learning

EXECUTIVE SUMMARY

Migratory anadromous fishes such as steelhead trout (*Oncorhynchus mykiss*) and white sturgeon (*Acipenser transmontanus*) are central concerns in the ecosystem restoration activities of the CALFED program. Restrictions on the abilities of these species to pass barriers such as dams and weirs are among the major reasons for the large-scale declines the populations of these species have suffered within the CALFED region and elsewhere. We propose a 3-year duration research program devoted to asking these two species of fishes what their preferences are with respect to the design and operation of passageways for them around or over major mechanical barriers to their movements in streams and rivers. The primary goal of the program will be to make specific recommendations concerning design and operation of fish passages that will optimize the operations of these passages from the standpoints of the fishes themselves, rather than primarily from the standpoints of engineering and economics. To our knowledge studies like those we propose have never been done for either species.

The general approach of the program will be identical for the two species; the details will vary according to their respective properties. Both studies will include field and laboratory components. Both studies will include upstream and downstream movements, and consider the appropriate life history stages of each. Both species are repeat spawners, adults making multiple migrations. The steelhead work will involve parr, smolts, and adults; the sturgeon work will be directed toward juveniles and adults (post-larval fish are apparently only passive drifters, not active migrants). We will study behavioral preferences as affected by time of day (nighttime behaviors of both species are almost unknown). We will also investigate six other major variables known to influence migratory movements of fishes that can be relatively easily manipulated in fish passage environments: i) current velocities; ii) water turbidities; iii) turbulence regimes; iv) light regimes (both intensities and wavelength distributions); v) sound regimes (both intensities and wavelength distributions); and vi) electrical fields.

Field observations will focus on trying to determine behavioral patterns of actively migrating wild fishes as they approach actual barriers that contain fish passages. We will try to correlate observed behaviors with real world variations in the six parameters listed. These studies are likely to be difficult as migration times for the adult fishes often coincide with peaks of water flow and turbidity. Specific locations within the CALFED region at which these observations can best be made will be determined by conditions during migration periods occurring during the study. Two probable locations will be the Nimbus Fish Hatchery on the American River (Sacramento County) and the Sacramento River near the Yolo Bypass (Sutter County).

Laboratory experimental studies will be carried out in a medium-sized experimental choice flume to be constructed at the Bodega Marine Laboratory (BML) of the University of California, Davis. BML is in the town of Bodega Bay (Sonoma County). The basic experimental design using this flume will be to carry out series of experiments each offering fishes choices of two alternate sets of conditions with respect to each of the variables to be tested. In the later stages of the studies complex combinations of more than one variable may be tested. After an initial period for startup of the project and construction and testing of the flume and experimental methods, two periods of one year each will be devoted to each species. The

steelhead will be studied first. The project will conclude with a period of working up of data obtained and writing of final reports. Research papers for publication in well-refereed scientific journals will be written at appropriate times during the project when sufficient data have been obtained.

The total cost of the project will be $350,770, to be expended over 3 years beginning October 1, 1999. There should be no adverse or third party impacts during the course of the project. It is our hope that significant policy and procedural changes for the CALFED region will result from the work with respect to fish passage construction and operation.

The Principal Investigator, Prof. Malcolm S. Gordon, is a fish physiologist and ecologist. He has been studying aspects of fish locomotion for over 30 years. He has been a member of the UCLA faculty for 41 years, and has published over 80 scientific research papers and 7 research-related books in the areas of animal physiology, ecology, and evolutionary biology. The two research associates to be employed on this project, one a post-doctoral associate who will be responsible for the day to day operation of the project, will be carefully selected by Prof. Gordon to ensure that they are fully qualified and able to carry out the work.

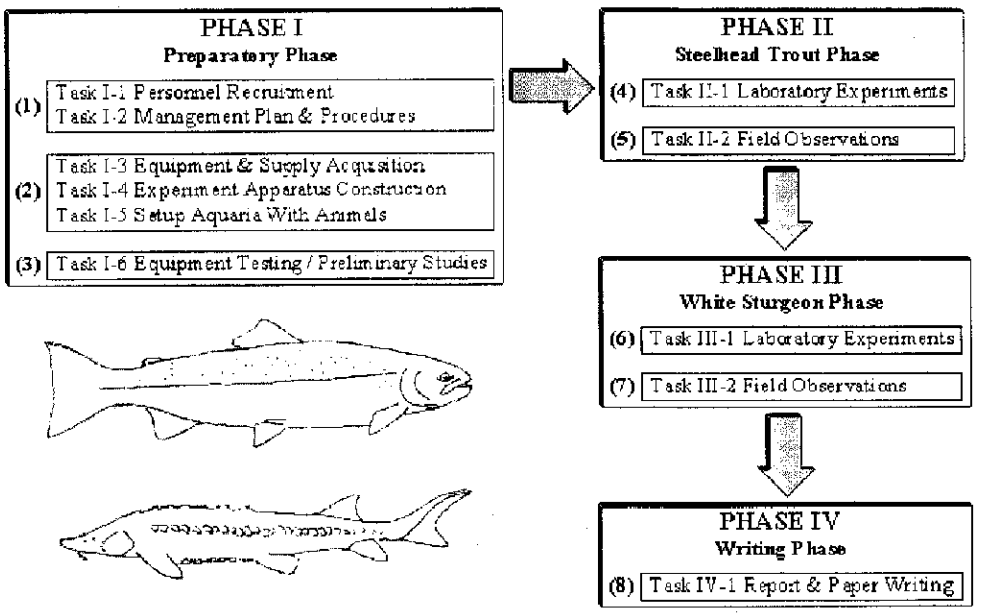
Our consultant, Prof. Joseph Cech, will make a significant contribution to the project. Prof. Cech has for a number of years carried out research relating to fish screens and irrigation diversions within the CALFED region. He has extensive personal knowledge of the Bay-Delta region, and of the fishes we will study. He also has a widespread network of connections both within UC Davis and with many people in relevant governmental agencies. His active participation in this project will ensure that our work is coordinated with other related research activities and that we may communicate in timely fashion with interested people in the agencies responsible for building and operating fish passages.

Project Description

Proposed Scope of Work

Migratory anadromous fishes such as steelhead trout *(Oncorhynchus mykiss)* and white sturgeon *(Acipenser transmontanus)* are central concerns in the ecosystem restoration activities of the CALFED program. Restrictions on the abilities of these species to pass barriers such as dams and weirs are among the major reasons for the large-scale declines the populations of these species have suffered within the CALFED region and elsewhere. We propose a 3 -year duration research program devoted to asking these two species of fishes what their preferences are with respect to the design and operation of passageways for them around or over major mechanical barriers to their movements in streams and rivers. The primary goal of the program will be to make specific recommendations concerning design and operation of fish passages that will optimize the operations of these passages from the standpoints of the fishes themselves, rather than primarily from the standpoints of engineering and economics. To our knowledge studies like those we propose have never been done for either species.

The principal investigator will be the manager for the entire project, which is outlined in the following diagram.



The project will have four phases. PHASE I (preparatory phase) includes personnel recruitment and physical setup for the project. Phases II and III will be the actual research with steelhead trout (PHASE II) and white sturgeon (PHASE III). Each of these will include series of separate tasks. PHASE IV includes writing of the final report and papers for publication. Quarterly reports will be written at the end of each quarter.

PHASE I consists of six tasks:

1) Personnel recruitment
2) Development of management plans and procedures
3) Equipment and supply acquisition
4) Construction of experimental apparatus
5) Setup of aquaria and obtaining experimental animals
6) Equipment testing and preliminary studies

The project will be managed through the Bodega Marine Laboratory by a post doctorate biologist. A staff research associate will be employed to help the project manager carry out the work. Video recording equipment, aquarium supplies and construction supplies for the experimental apparatus will be purchased for use in the research phases. The experimental apparatus will be a variable speed flume with two partitioned environmental choices. The environmental parameters for the fishes to choose between will be a range of water velocities, turbidities, light (both wavelength composition and intensity), turbulence, sound (composition and levels), and electrical field strengths (parameters are listed in order of priority). The flume and these environmental conditions will simulate present and potential fishway conditions. As time and personnel availability permit, tasks I-3, I-4 and I-5 will be carried out in parallel to maximize cost effectiveness. Equipment testing and preliminary studies will be done to precisely define experimental protocols.

The steelhead trout phase will be divided into laboratory and field tasks. The laboratory task will first quantify the swimming performance of juvenile and adult steelhead trout over the species' full range of swimming speeds. Swimming performance will be analyzed in the swimming flume over the ranges of six environmental parameters mentioned above. We will also describe the preferences of the same fish when presented a choice between two grades of a single environmental parameter in the flume (the six parameters will be tested individually). The field task will describe the behavior of steelhead trout approaching, traveling through and leaving fishways. It will also gather a database on the environmental conditions in and around these fishways while the trout are moving through them (both up and downstream and during day and night hours).

Phase III (white sturgeon phase) will consist of the same laboratory and field tasks as Phase II with a few modifications. Due to the complications of working with large adult sturgeon, only juveniles will be used in this phase. The observations of migrating fishes through fishways will not be made on sturgeon. Fishways do not exist along the present migration path of white sturgeon in the Sacramento River and their migrating habitat is too turbid and deep. Instead, observations of migrating sturgeon will be attempted at the Red Bluff Diversion Dam and the Sacramento River weirs along the migration route of white sturgeon.

TASK SCHEDULE

This proposal is scheduled for three years of support starting on October 1, 1999 and finishing by September 30, 2002. A calendar summarizing the project's task schedule is given in table1 (see Cost section).

The preparatory phase will start with recruiting and hiring personnel and developing the management plan and procedures. Tasks I-3, I-4 and I-5 will start by mid-November and be completed by January 31, 2000 when equipment testing and preliminary studies will start. PHASE I will be completed by March 31, 2000. During November of this period, the first observations of migrating trout in fishways will be made (part of Task II-2) to aid in designing biologically relevant laboratory protocols.

The laboratory task of the trout phase will start by April 1, 2000 and will continue until March 31, 2001. This task will be followed with the sturgeon laboratory task by April 1, 2001 and will be completed by March 31, 2002. During April of this latter period, the first observations of migrating sturgeon will be made (part of Task III-2) to complement Task III-1. The rest of the field observation tasks of Phases II and III will be done from October 1 to December 31, 2000 (trout) and March 1 to May 31, 2002 (sturgeon) to coincide with their dominant migration times.

Quarterly reports will be written and submitted at the end of each quarter. The final report will be written starting in June 2002.

INTERTASK DEPENDENCE

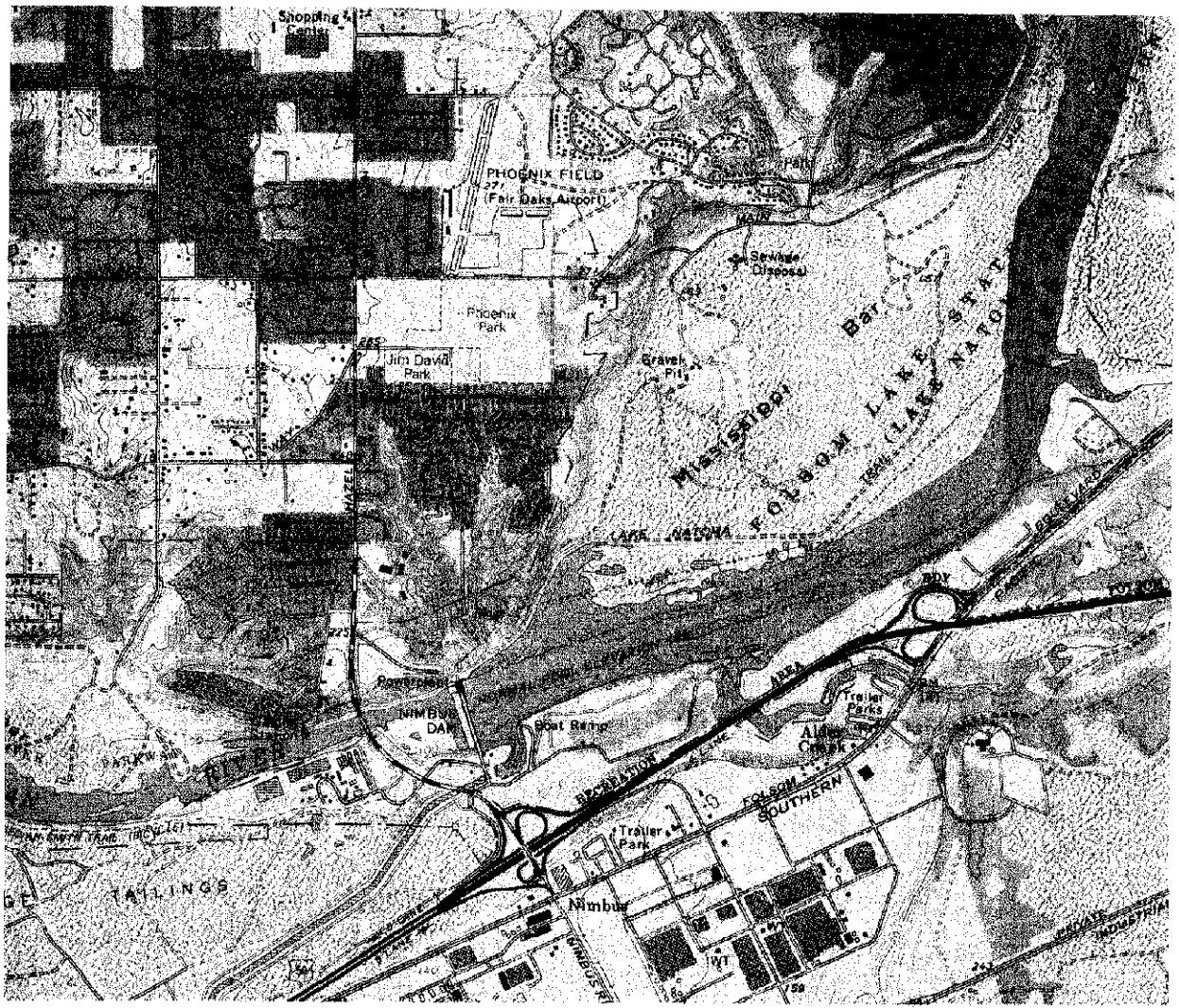
The preparatory phase of this project is necessary for the completion of both PHASE II and PIIASE III. The trout and sturgeon phases of this project are completely independent from each other with PIIASE II having the highest priority. The field tasks within the research phases are heavily reliant on the results of their respective laboratory tasks. All the environmental parameters proposed are independent of each other and listed in order of priority.

Location and/or Geographic Boundaries of the Project

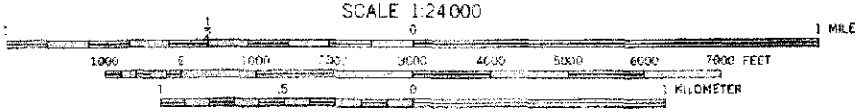
This project will be conducted in two counties (with the possibility of a third if results require that). All of the laboratory work will be done at the Bodega Marine Laboratory (Sonoma County; latitude 38.32 N, longitude 123.07 W). The Nimbus Fish Hatchery in Sacramento County (latitude 38.63 N, longitude 121.22 W) is the probable field site. Verbal permission has been granted to make observations of migrating steelhead trout at the hatchery. The Nimbus Fish Hatchery is located on the American River. The relevant portions of 7.5 minute series USGS topographical maps (scale 1:24,000) are included for each site.

FOLSOM QUADRANGLE
CALIFORNIA
7.5 MINUTE SERIES (TOPOGRAPHIC)

QUADRANGLE LOCATION



SCALE 1:24000



CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

I —0 1 3 4 5 9

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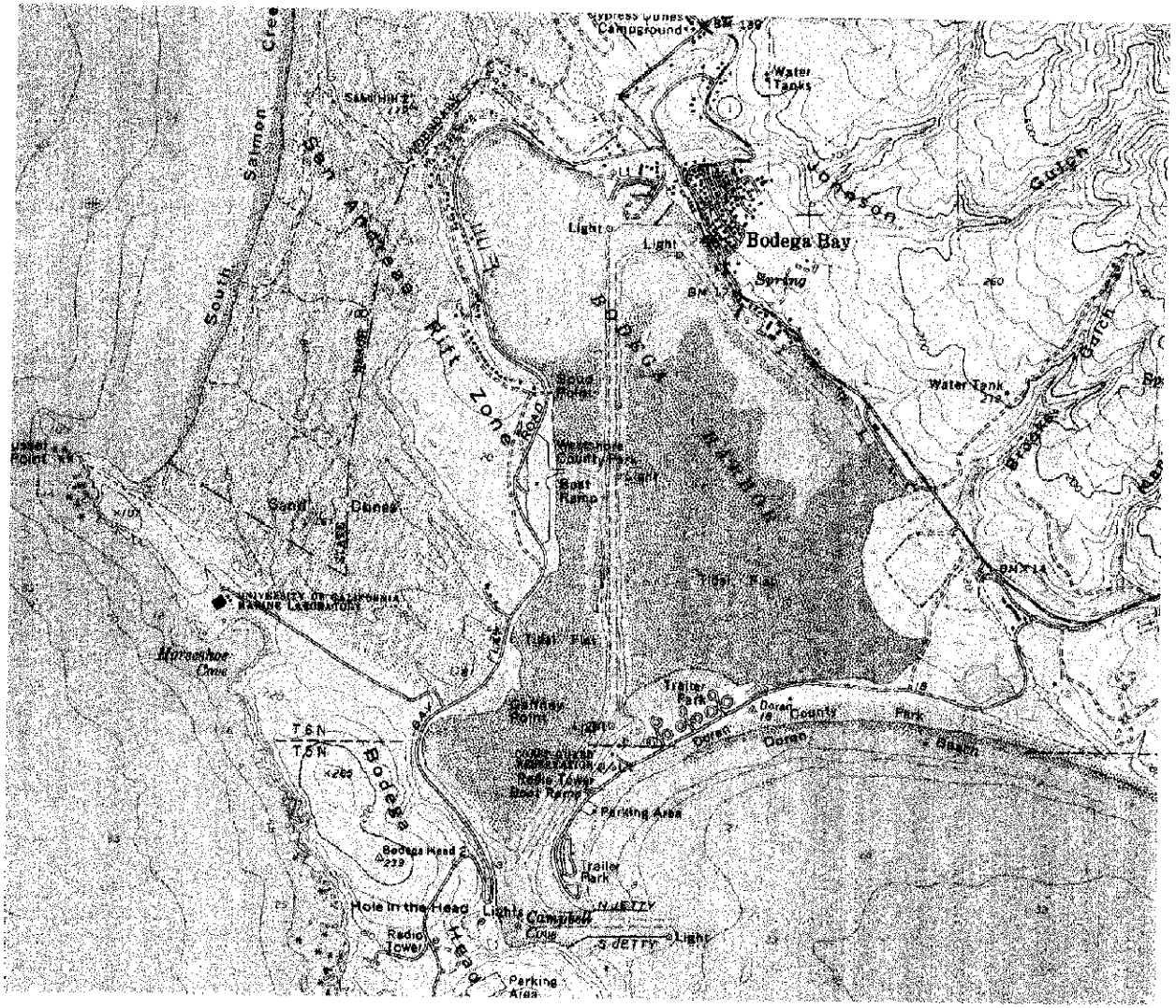
BODEGA HEAD QUADRANGLE

CALIFORNIA – SONOMA CO.

7.5 MINUTE SERIES (TOPOGRAPHIC)

QUADRANGLE LOCATION



SCALE 1:24 000

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 5 0 1 KILOMETER

CONTOUR INTERVAL 40 FEET
DOTTED LINES REPRESENT 20-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

DEPTH CURVES AND SOUNDINGS IN FEET – DATUM IS MEAN LOWER LOW WATER

SHORELINE SHOWN REPRESENTS THE APPROXIMATE LINE OF MEAN HIGH WATER
THE MEAN RANGE OF TIDE IS APPROXIMATELY 4 FEET

I —0 1 3 4 6 0

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Ecological/Biological Benefits

OBJECTIVES

The primary objective is to enhance the California steelhead trout (*Oncorhynchus mykiss*) and white sturgeon (*Acipenser transmontanus*) populations by obtaining more optimal fishway designs. These native California anadromous fishes are of great economical and recreational interest and have severely suffered do to migration interference by dams and other structures. Steelhead trout migrations are restricted throughout the Sacramento/San Joaquin Bay-Delta system by dams, a situation which has contributed to the listing of Central California steelhead trout as federally threatened (CALFED Bay-Delta Program 1999a, Wildlife and Habitat Data Analysis Branch 1999). Weirs in the Yolo and Sutter bypasses and possibly the Red Bluff Diversion Dam (Kohlhorst 1999) have impeded white sturgeon migrations and some of their spawning habitat has been lost due to the Shasta Dam (Schaffter 1997). By improving the design of fishways, more fishes will be able reach their natural spawning areas which will lead to an increase in the wild abundance of these high priority native fishes. Secondly, a higher trout and sturgeon abundance will allow for a larger sport fishery and a healthier ecosystem in the Sacramento/San Joaquin River System. This project will help the CALFED Bay-Delta Program reach its goals and it will promote the interests of organizations such as the American Fisheries Society, American Rivers, and Trout Unlimited.

Poor fishway design impacts anadromous fishes in many ways. A slower rate of passage causes crowding before dams and in fishways. This allows for increases in predation on anadromous fishes and it prolongs their migration period. Both of these factors decrease the likelihood of fishes reaching their spawning grounds. Excluding the effort required to pass a fishway, anadromous fishes expend about 80% of their total energy to reach their spawning grounds leaving only 20% in reserve (Evans and Johnston 1980). A sub-optimally designed fishway may decrease their reserve energy and lower the numbers reaching spawning grounds. Downstream migration traditionally yields large losses of migrating fishes. This is due to fishes passing over high spillways, being caught in hydroelectric turbines, predation and not being able to find fishway entrances (Clay 1995). Sale et al. (1991) suggests that no downstream protection system is biologically effective, practical to install and operate and widely accepted. The improvement of fishway design will allow for more effective fishways, which will increase the health of anadromous fish populations and decrease the management responsibilities within that watershed such as hatchery fish stocking.

The results of this project may be applied to all, present and future, fishways in steelhead trout and white sturgeon habitat. These results will be valid for many generations to come since the behavior and swimming performance of individual fish species evolve at relatively slow rates. The conclusions of this project many be incorporated into adaptive management programs in California streams as long as dams are present and anadromous fishes continue to return.

LINKAGE

Fishways were first constructed on rivers no later than the 1700s (Clay 1995). Fishways remained relatively unchanged until science was employed in their design during the 20th century and then only hydraulic science was applied (Denil 1909 from Clay 1995). Fish behavior was not considered in fishway design until Mcleod and Nemnyi's 1941 study. Since this study, Stuart (1962) is the only biologist, which we are aware of, to provide specific details of fish behavior

while passing through fishways. A few studies have been done on fish barriers used in directing fishes but these reports are not widely available and address only a small portion of the problem (EPRI report # TR-111571). The progress of improving fishway design has been very slow due to the lack of available biological data on migrating fishes (Clay 1995). Traditionally, biologists are only involved by estimating the effectiveness of existing fishways. The need for biological investigations of fish behavior and swimming performance as it relates to fishway design is long overdue and awaited for (Clay 1996, Flosi et al. 1998, Peake et al. 1997, Mallen-Cooper 1994).

A common goal of the ERP, CALFED Bay-Delta Program Strategic Plan and this project is to maintain and enhance populations of steelhead trout and white sturgeon by improving fish passage design (ERP Vol. 1, page 433-4; CALFED Strategic Plan, Table 5-1). Migrating white sturgeon are affected by obstructions in the Sacramento River and the Feather River/Sutter Basin (ERP Vol. 1 page 424; ERP Vol. 2 pages 165, 276). Steelhead trout are affected by dams and other structures in the following ecological management zones (ERP Vol. 1 page 424; ERP Vol. 2 pages 165, 198, 247, 276, 358, 406):

1) Sacramento River
2) North Sacramento Valley
3) Butte Basin
4) Feather River/Sutter Basin
5) Eastside Delta Tributaries
6) East San Joaquin Basin

Improved fishways will decrease negative effects of dams on fish populations migrating up and down streams (ERP Vol. 1, page 419, 430). Many currently operating fishways are technologically outdated and marginally effective. Fishes are often delayed in passing through fishways or are not able to use them at all (ERP Vol. 1 page 430). Improving fishways by employing optimal designs will improve fish passage, restore anadromous fish spawning above dams and barriers and ultimately promote healthy sustainable fisheries (ERP Vol. 1 page 430).

Both federal and state agencies are mandated to protect fish populations. For example, the Anadromous Fish Conservation Act authorizes the Secretary of the Interior to promote the conservation, development and enhancement of anadromous fishes in the United States. A part of the California Fish and Game Code [the Keene-Nielsen Fisheries Restoration Act (Sections 2760-2765)] mandates that California protect and restore migratory fish populations (specifically wild steelhead trout) that are adversely affected by water development projects such as dams. In addition, California Fish and Game Code sections 5930-5948 mandate that dam owners construct functional fishways to the satisfaction of California's Department of Fish and Game. The results of this project will aid the agencies mandated to protect California's anadromous fishes.

SYSTEM-WIDE ECOSYSTEM BENEFITS

Improving fishway design will benefit many fish populations and habitats. Improving fish passage rates will decrease overcrowding in areas adjacent to dams. This will also allow for fishes to inhabit previously restricted portions of a stream and will open up more spawning habitat. Efficient fishways will assist in increasing anadromous fish populations and create more abundant fisheries.

COMPATIBILITY WITH NON-ECOSYSTEM OBJECTIVES

This project will have little or no interaction with CALFED's five non-ecosystem programs. It takes an ecosystem restoration approach by focusing on improving the migration efficiency of anadromous fish populations without impinging on other CALFED objectives.

Improving fishway design will benefit dam owners by decreasing the resources spent on anadromous fishes. An ineffective fishway may require them to supplement a suppressed wild fish population with hatchery fish to make up for losses (American Rivers 1996). Inundating wild fish with hatchery fish most likely jeopardizes the integrity of wild populations and consequently increases the problem of declining wild fish populations (Beamish et al. 1997, McMichael et al. 1997, Nickelson et al. 1986, Swain and Riddell 1990). Ineffective fishways may also lead to dam owners spending considerable time and money trucking fishes over dams (American Rivers 1996, Clay 1995). Without considering species specific behaviors, a fishway may need expensive renovation after its completion by the fishway owner if the fishways proves to be unsuccessful. This happened with the construction of an allice shad, *Alosa alosa*, fishway at Bergerac on the Dordogne River in France (Larinier 1983 from Clay 1995). Providing dam owners with optimal fishway designs will reduce the environmental impacts of dams and limit the time and money needed to maintain or enhance anadromous fish populations.

Technical Feasibility and Timing

The traditional alternative to fishway design is to replicate a previously constructed fishway with little or no consideration for the species of interest. Improvements have primarily been made from hydraulic laboratory studies while ignoring the behavior of the migrating fishes. Studying anadromous fishes in laboratory "fishways" will allow for future fishway designs to be more compatible with the fishes passing through them and will reduce the effects of dams on their local fisheries.

Environmental compliance documents will not be needed for this project. The laboratory portion of this project will be at the Bodega Marine Laboratory (BML) where the BML Salmon Project manager and BML Associate Director, Paul Siri, will make space available. Field observations will be made primarily at the Nimbus Fish Hatchery. Verbal permission has been granted to make observations of migrating steelhead trout at the hatchery. Prior to initiating Task I-6, this proposal will need approval by the Institutional Animal Care and Use Committee at UC Davis (Animal Use and Care Administrative Advisory Committee; AUCAAC). This committee meets bimonthly providing plenty of time for approval during Tasks I-1, 2, 3, 4 and 5.

Arrangements for the acquisition of experimental animals have been made. Trout will be obtained through BML's previously arranged delivery service from Warm Springs Hatchery in Sonoma County. Prof. Serge Doroshov in the Animal Science Department at UC Davis will supply the sturgeon. All experimental animals will be maintained at the BML aquarium facilities.

Monitoring and Data Collection Methodology

We will describe and quantify the behavior and swimming performance of steelhead trout and white sturgeon under various environmental conditions in an experimental flume that simulates fishways. We will also describe the behavior of these fishes in and around fishways. This approach will provide biologists and engineers with information to design more optimal fishways.

The environmental parameters used in the swimming performance and behavior experiments will be a range of water velocities, turbidities, light (both wavelength composition and intensity), turbulence, sound (composition and levels), and electrical field strengths (parameters are listed in order of priority). The flume and these environmental conditions will simulate present and potential fishway conditions. Maximum sustainable (> 200 min), prolonged (20 sec - 200 min) and burst (highest speeds obtainable) swimming speeds vary greatly between species of fish (Beamish 1978). Knowledge of this aspect of swimming performance is crucial in the design of fishway flow velocities (Peake et al. 1997, Government of Canada 1980, Clay 1995). The high turbidity levels found in the Sacramento River are suggested to have an effect on the swimming performance and behavior of some Bay-Delta fishes (Cech unpublished data). Light levels are known to influence the behavior of many fishes (Moyle and Cech 1988) including their passage through fishways (Haro and Kynard 1997). Turbulence is often maximized in the water flowing through fishways to dissipate the energy carried in the water (Clay 1995) but the effect of turbulence on the swimming performance and behavior of fishes has received little attention. Bond (1996) suggests that sound is a stimulus for guiding migrating fishes. Many fishes are attracted to the cathode of a direct current electrical field, which has been used in fisheries work to direct fishes to pumps and nets (Bond 1996).

Swimming performance trials will be run in a variable speed swimming flume. Performance will be evaluated as endurance time over a range of velocities (0.5 BL/s intervals from 1 BL/s to minimum unendurable velocities; BL/s = body lengths per second). Standard swimming performance protocols (Brett 1964) will be modified based on preliminary studies (Task I-6). Swimming performance trials will be run under the environmental parameters mentioned above. The behavioral component will be conducted in the swimming flume used for the swimming performance experiments. Fishes will be presented with a choice between two environmental parameters (listed above). Video will be taken of the animals during these trials for detailed motion analysis. This analysis will allow for quantitative descriptions of fish behavior. Field observations will be made of steelhead trout and white sturgeon at obstructions and fishways. Their behavior will be filmed for use in similar motion analyses and environmental parameters will be noted for use in correlative analyses between laboratory and field behaviors.

Project updates including study result and spending summaries and any project modifications will be submitted quarterly. A final report will be written explaining the results and conclusions of the entire project along with a detailed description of the project's spending. In addition to the final report, a manuscript(s) will be submitted to peer reviewed scientific journals. Reprints of any publications arising from this study will be provided to the CALFED Bay-Delta Program.

Table 1. Task Schedule Calendar

Year	October	November	December	January	February	March	April	May	June	July	August	September
1999-2000	I-1	I-2, 3, 4, 5 II-2	I-3, 4, 5	I-3, 4, 5 Qtrly Rep	I-6	I-6	II-1 Qtrly Rep	II-1	II-1	II-1 Qtrly Rep	II-1	II-1
2000-2001	II-1 II-2 Qtrly Rep	II-1 II-2	II-1 II-2	II-1 Qtrly Rep	II-1	II-1	III-1 III-2 Qtrly Rep	III-1	III-1	III-1 Qtrly Rep	III-1	III-1
2001-2002	III-1 Qtrly Rep	III-1	III-1	III-1 Qtrly Rep	III-1	III-1 III-2	III-2 Qtrly Rep	III-2	IV-1	IV-1 Qtrly Rep	IV-1	IV-1

PHASE I Preparatory Phase
- I-1: personnel recruitment
- I-2: management development
- I-3: equipment & supply acquisition
- I-4: construction of experimental apparatus
- I-5: setup aquaria with animals
- I-6: equipment testing / preliminary studies

PHASE II Steelhead Trout
- I-1: laboratory experiments
- I-2: field observations

PHASE III White Sturgeon
- I-1: laboratory experiments
- I-2: field observations

PHASE IV Writing Phase
- IV-1: report & paper writing

Table 2. Monitoring and Data Collection Information

Hypothesis/Question to be Evaluated	Monitoring Parameters(s) and Data Collection Approach	Data Evaluation Approach	Comments/Data Priority
1) What are the behaviors and swimming performances of steelhead trout in simulated fishway conditions?	Present fish with multiple environmental conditions to choose between	A) Describe their choice preferences B) Quantify their swimming performances	Questions one and two have the highest priority.
2) What are the behaviors of steelhead trout in and around fishways?	Film fish approaching, passing through and exiting fishways	Quantify and describe observed patterns of behavior	
3) What are the behaviors and swimming performances of white sturgeon in simulated fishway conditions?	Present fish with multiple environmental conditions to choose between	A) Describe their choice preferences B) Quantify their swimming performances	
4) What are the behaviors of white sturgeon in and around stream obstructions?	Film fish approaching, passing through and exiting fishways	Quantify and describe observed patterns of behavior	

I-013465

Local Involvement

A letter summarizing the proposed project and how it involves the respective county has been sent to the County Boards of Supervisors and County Planning Departments for Sonoma and Sacramento Counties:

County of Sonoma

Mike Reilly, District 5 Supervisor (County Board of Supervisors)

Christine Arnold, Director (Permit and Resource Management Department)

County of Sacramento

Don Nottoli, District 5 Supervisor (County Board of Supervisors)

Main Office (Planning & Community Development Department)

Copies of these letters are included with this proposal. Due to the research nature of this project, a public outreach plan has not been developed.

Cost

A detailed description of the project budget is given in the Total Budget and Quarterly Budget tables (Tables 3 and 4). The principal investigator will be responsible for the project management task. The cost associated with this task will be zero except for miscellaneous and other direct costs included with research costs (such as travel and phone calls within California).

A complete three year project calendar correlated with the budget tables is given in Table 1. The project will start on October 1, 1999 and the final report will be completed by September 30, 2002. Major payment milestones will be the completion dates for each of the four phases. Potential funding increments could be based upon the prioritization of tasks described above in the section on Intertask Dependence (under Project Description).

Total Budget

Task/Phase	Direct Labor Hours	Direct Salary and Benefits	Service Contracts	Material and Acquisition Costs	Miscellaneous and other Direct Costs	Overhead and Indirect Costs	Total
I-1			0	$ 20	$ 80	$ 26	$ 126
I-2	160	$ 3,008	0	$ 20	$ 80	$ 808	$ 3,916
I-3	267	$ 5,011	0	$ 16,520	$ 80	$ 1,329	$ 22,940
I-4	267	$ 5,011	0	$ 60	$ 240	$ 1,381	$ 6,692
I-5	267	$ 5,011	0	$ 200	$ 800	$ 1,563	$ 7,574
I-6	672	$ 12,031	0	$ 60	$ 240	$ 3,206	$ 15,537
II-1	3528	$ 64,239	0	$ 3,562	$ 14,248	$ 21,333	$ 103,382
II-2	504	$ 9,383	0	$ 509	$ 2,035	$ 3,101	$ 15,028
III-1	3696	$ 70,182	0	$ 3,732	$ 14,927	$ 23,099	$ 111,940
III-2	1008	$ 19,392	0	$ 1,018	$ 4,071	$ 6,365	$ 30,846
IV-1	1344	$ 26,021	0	$ -	$ -	$ 6,765	$ 32,786
Project Management Task	0	0	0	0	0		
TOTAL	11,713	$ 219,289	$ -	$ 25,701	$ 36,801	$ 68,976	$ 350,767

Overhead and indirect costs have been calculated at the Off-campus rate of 26% MTDC. The rate is negotiated and approved by the Department of Health and Human Services, UCLA's cognizant federal agency. The modified total direct cost base consists of total direct costs less tuition and fee remission, equipment, capital expenditures, patient care, rental costs, scholarships, and fellowships and the portion of each subgrant and subcontract in excess of $25,000.

The indirect cost rate applies to both federal and state agencies.

COST SHARING:

UCLA will cost share 10% of Dr. Malcolm Gordon's salary, benefits and indirect costs.

Table 4 - Quarterly Budget

	Oct-Dec 99	Jan-Mar 00	Apr-Jun 00	Jul-Sep 00	Oct-Dec 00	Jan-Mar 01	Apr-Jun 01	Jul-Sep 01	Oct-Dec 01	Jan-Mar 02	Apr-Jun 02	Jul-Sep 02	Totals
I-1	126	0	0	0	0	0	0	0	0	0	0	0	126
I-2	3916	0	0	0	0	0	0	0	0	0	0	0	3916
I-3	15293	7647	0	0	0	0	0	0	0	0	0	0	22940
I-4	4461	2231	0	0	0	0	0	0	0	0	0	0	6692
I-5	5049	2525	0	0	0	0	0	0	0	0	0	0	7574
I-6	0	15537	0	0	0	0	0	0	0	0	0	0	15537
II-1	0	0	29536	29536	14773	29536	0	0	0	0	0	0	103382
II-2	0	0	0	0	15028	0	0	0	0	0	0	0	15028
III-1	0	0	0	0	0	0	25444	30526	30526	25444	0	0	111940
III-2	0	0	0	0	0	0	5142	0	0	5142	20565	0	30849
IV-1	0	0	0	0	0	0	0	0	0	0	8197	24590	32786
Project	0	0	0	0	0	0	0	0	0	0	0	0	0
Management													0
Task													0
Totals	28846	27939	29536	29536	29801	29536	30586	30526	30526	30586	28762	24590	350770

I-013468

APPLICANT QUALIFICATIONS
MALCOLM S. GORDON, PRINCIPAL INVESTIGATOR
Professor of Biology, University of California, Los Angeles (UCLA)

Date of birth: November 13, 1933 Place of birth: New York, N.Y.
Married, one child

Employment:

Faculty member, Departments of Zoology, later Biology, UCLA, since 1958; Professor since 1968. Director, Institute of Evolutionary and Environmental Biology, 1970-76. On leave as Assistant Director - Research, National Fisheries Center and Aquarium, U.S. Department of the Interior, Washington, D.C., 1968-69. Visiting faculty appointments: Faculty of Biology, University of Chile, Santiago, 1967; Department of Biology, Chinese University of Hong Kong, 1971-72; Board of Studies in Biology, University of California, Santa Cruz, 1980.

Education:

B.A. with High Honors in Zoology, Cornell University, 1954; Ph.D. in Zoology, Yale University, 1958.

Fellowships:

National Science Foundation Regular Predoctorals, Yale,1954-57; Fulbright, University of Cambridge, England. 1957-58; Guggenheim, University of Copenhagen, Denmark, 1961-62; Senior Queen's in Marine Science, Australia, 1976; U.S. National Academy of Sciences - Academy of Sciences of the USSR lectureships, 1965 and 1973.

Editorial Boards:

University of California Press, 1977-82; American Zoologist, 1980-84; Journal of Experimental Zoology, 1990-93; Fish Physiology and Biochemistry, 1984-present.

Major positions in scientific organizations:

Chair, Division of Ecology (1979-80) and Chair, Division of Comparative Physiology and Biochemistry (1988-89), American Society of Zoologists; Chair, Interunion Commission on Comparative Physiology, International Unions of Physiological Sciences and Pure and Applied Biophysics, 1993-present.

Principal research interests:

Comparative ecological animal physiology (emphasis on fish physiology); experimental marine biology; evolutionary biology; animal biomechanics; aquaculture. Current research primarily on the biomechanics and hydrodynamics of fish locomotion.

Publications:

Over seventy research papers, seven books, two motion pictures.

References

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SANTA BARBARA • SANTA CRUZ

DEPARTMENT OF ORGANISMIC BIOLOGY, ECOLOGY AND EVOLUTION
621 CIRCLE DRIVE SOUTH
BOX 951606
LOS ANGELES, CALIFORNIA 90095-1606
FAX: (310) 206-3987

April 14, 1999

Planning & Community Development Department
Main Office
County of Sacramento
827 7th Street, Room 230
Sacramento, CA 95814

Dear People:

The CALFED Bay-Delta program has requested that all applicants for ecosystem restoration program funding notify the county in which the applicant proposes to work. I am proposing a research project to be done primarily at the Bodega Marine Laboratory (BML) of the University of California, Davis in Sonoma County. I have proposed to describe the behavior of steelhead trout and white sturgeon in experimental fishways. The results of this study will be used to improve the effectiveness of fishways at California's many dams and other stream obstructions. This project does incorporate a field observation component that will take place at the Nimbus Fish Hatchery in Rancho Cordova. Salmonids traveling up the Nimbus Fish Hatchery fishway into the hatchery will be filmed for behavioral analyses. I have received permission from the hatchery personnel to make these observations and film the fishes. If you have any questions or comments about the proposed project, please feel free to contact me at the below address or by e-mail at msgordon@ucla.edu.

Sincerely,

Malcolm Gordon

Malcolm Gordon
Professor
University of California, Los Angeles
621 Charles E. Young Drive
Los Angeles, California 90095-1606

I-013472

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DEPARTMENT OF ORGANISMIC BIOLOGY, ECOLOGY AND EVOLUTION
621 CIRCLE DRIVE SOUTH
BOX 951606
LOS ANGELES, CALIFORNIA 90095-1606
FAX: (310) 206-3987

April 14, 1999

Mr. Don Nottoli
District 5 Supervisor
County of Sacramento
700 H Street Suite 2450
Sacramento, California 95814

Dear Mr. Nottoli:

The CALFED Bay-Delta program has requested that all applicants for ecosystem restoration program funding notify the county in which the applicant proposes to work. I am proposing a research project to be done primarily at the Bodega Marine Laboratory (BML) of the University of California, Davis in Sonoma County. I have proposed to describe the behavior of steelhead trout and white sturgeon in experimental fishways. The results of this study will be used to improve the effectiveness of fishways at California's many dams and other stream obstructions. This project does incorporate a field observation component that will take place at the Nimbus Fish Hatchery in Rancho Cordova. Salmonids traveling up the Nimbus Fish Hatchery fishway into the hatchery will be filmed for behavioral analyses. I have received permission from the hatchery personnel to make these observations and film the fishes. If you have any questions or comments about the proposed project, please feel free to contact me at the below address or by e-mail at msgordon@ucla.edu.

Sincerely,

Malcolm Gordon
Professor
University of California, Los Angeles
621 Charles E. Young Drive
Los Angeles, California 90095-1606

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I-013473

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DEPARTMENT OF ORGANISMIC BIOLOGY, ECOLOGY AND EVOLUTION
621 CIRCLE DRIVE SOUTH
BOX 951606
LOS ANGELES, CALIFORNIA 90095-1606
FAX: (310) 206-3987

April 14, 1999

Ms. Christine Arnold
Permit and Resource Management Department, Director
County of Sonoma
2550 Ventura Avenue
Santa Rosa, California 95403

Dear Ms. Arnold:

The CALFED Bay-Delta program has requested that all applicants for ecosystem restoration program funding notify the county in which the applicant proposes to work. I am proposing a research project to be done at the Bodega Marine Laboratory (BML) of the University of California, Davis. I have proposed to describe the behavior of steelhead trout and white sturgeon in experimental fishways. The results of this study will be used to improve the effectiveness of fishways at California's many dams and other stream obstructions. All Sonoma County aspects of this project will be done at the BML and arrangements have been made with the associate director of the laboratory, Paul Siri. If you have any questions or comments about the proposed project, please feel free to contact me at the below address or by e-mail at msgordon@ucla.edu.

Sincerely,

Malcolm Gordon
Professor
University of California, Los Angeles
621 Charles E. Young Drive
Los Angeles, California 90095-1606

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621 CIRCLE DRIVE SOUTH
BOX 951606
LOS ANGELES, CALIFORNIA 90095-1606
FAX: (310) 206-3987

April 14, 1999

Mr. Mike Reilly
District 5 Supervisor
County of Sonoma
575 Administration Drive
Room 100A
Santa Rosa, California 95403

Dear Mr. Reilly:

The CALFED Bay-Delta program has requested that all applicants for ecosystem restoration program funding notify the county in which the applicant proposes to work. I am proposing a research project to be done at the Bodega Marine Laboratory (BML) of the University of California, Davis. I have proposed to describe the behavior of steelhead trout and white sturgeon in experimental fishways. The results of this study will be used to improve the effectiveness of fishways at California's many dams and other stream obstructions. All Sonoma County aspects of this project will be done at the BML and arrangements have been made with the associate director of the laboratory, Paul Siri. If you have any questions or comments about the proposed project, please feel free to contact me at the below address or by e-mail at msgordon@ucla.edu.

Sincerely,

Malcolm Gordon
Professor
University of California, Los Angeles
621 Charles E. Young Drive
Los Angeles, California 90095-1606

State of California DEPARTMENT OF WATER RESOURCES The Resources Agency

Agreement No. _____

Exhibit _____

STANDARD CLAUSES -
INTERAGENCY AGREEMENTS

Audit Clause. For contracts in excess of $10,000, the contracting parties shall be subject to the examination and audit of the State Auditor for a period of three years after final payment under the contract. (Government Code Section 8546.7).

Availability of Funds. Work to be performed under this contract is subject to availability of funds through the State's normal budget process.

Interagency Payment Clause. For services provided under this agreement, charges will be computed in accordance with State Administrative Manual Section 8752 and 8752.1.

Termination Clause. Either State agency may terminate this contract upon 30 days advance written notice. The State agency providing the services shall be reimbursed for all reasonable expenses incurred up to the date of termination.

Severability. If any provision of this Agreement is held invalid or unenforceable by any court of final jurisdiction, it is the intent of the parties that all other provisions of this Agreement be construed to remain fully valid, enforceable, and binding on the parties.

Y2K Language The Contractor warrants and represents that the goods or services sold, leased, or licensed to the State of California, its agencies, or its political subdivisions, pursuant to this Agreement are "Year 2000 compliant." For purposes of this Agreement, a good or service is Year 2000 compliant if it will continue to fully function before, at, and after the Year 2000 without interruption and, if applicable, with full ability to accurately and unambiguously process, display, compare, calculate, manipulate, and otherwise utilize date information. This warranty and representation supersedes all warranty disclaimers and limitations and all limitations on liability provided by or through the Contractor.

DWR 4187 (REV. 1/99)

I —013476

I-013476

U.S. Department of the Interior

Certifications Regarding Debarment, Suspension and Other Responsibility Matters, Drug-Free Workplace Requirements and Lobbying

Persons signing this form should refer to the regulations referenced below for complete instructions:

Certification Regarding Debarment, Suspension, and Other Responsibility Matters - Primary Covered Transactions - **The prospective primary participant further agrees by submitting this proposal that it will include the clause titled, "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transaction," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.** See below for language to be used or use this form certification and sign. (See Appendix A of Subpart D of 43 CFR Part 12.)

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions - (See Appendix B of Subpart D of 43 CFR Part 12.)

Certification Regarding Drug-Free Workplace Requirements - Alternate I. (Grantees Other Than Individuals) and Alternate II. (Grantees Who are Individuals) - (See Appendix C of Subpart D of 43 CFR Part 12)

Signature on this form provides for compliance with certification requirements under 43 CFR Parts 12 and 18. The certifications shall be treated as a material representation of fact upon which reliance will be placed when the Department of the Interior determines to award the covered transaction, grant, cooperative agreement or loan.

PART A: Certification Regarding Debarment, Suspension, and Other Responsibility Matters-Primary Covered Transactions

CHECK IF THIS CERTIFICATION IS FOR A PRIMARY COVERED TRANSACTION AND IS APPLICABLE.

(1) The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded by any Federal department or agency;

(b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

(2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

PART B: Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions

CHECK X IF THIS CERTIFICATION IS FOR A LOWER TIER COVERED TRANSACTION AND IS APPLICABLE.

(1) The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

(2) Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

This form was electronically produced by Elite Federal Forms, Inc.

DI-2010
June 1995
(This form replaces DI-1953, DI-1954, DI-1955, DI-1956 and DI-1963)

PART C: Certification Regarding Drug-Free Workplace Requirements

CHECK X IF THIS CERTIFICATION IS FOR AN APPLICANT WHO IS NOT AN INDIVIDUAL.

Alternate I. (Grantees Other Than Individuals)

A. The grantee certifies that it will or continue to provide a drug-free workplace by:

(a) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition;

(b) Establishing an ongoing drug-free awareness program to inform employees about--
(1) The dangers of drug abuse in the workplace;
(2) The grantee's policy of maintaining a drug-free workplace;
(3) Any available drug counseling, rehabilitation, and employee assistance programs; and
(4) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace;

(c) Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph (a);

(d) Notifying the employee in the statement required by paragraph (a) that, as a condition of employment under the grant, the employee will --
(1) Abide by the terms of the statement, and
(2) Notify the employer in writing of his or her conviction for a violation of a criminal drug statute occurring in the workplace no later than five calendar days after such conviction;

(e) Notifying the agency in writing, within ten calendar days after receiving notice under subparagraph (d)(2) from an employee or otherwise receiving actual notice of such conviction. Employers of convicted employees must provide notice, including position title, to every grant officer on whose grant activity the convicted employee was working, unless the Federal agency has designated a central point for the receipt of such notices. Notice shall include the identification number(s) of each affected grant;

(f) Taking one of the following actions, within 30 calendar days of receiving notice under subparagraph (d)(2), with respect to any employee who is so convicted --
(1) Taking appropriate personnel action against such an employee, up to and including termination, consistent with the requirements of the Rehabilitation Act of 1973, as amended; or
(2) Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency;

(g) Making a good faith effort to continue to maintain a drug-free workplace through implementation of paragraphs (a) (b), (c), (d), (e) and (f).

B. The grantee may insert in the space provided below the site(s) for the performance of work done in connection with the specific grant:

Place of Performance (Street address, city, county, state, zip code)

621 Young Drive, South

Los Angeles, CA 90095

Check___if there are workplaces on files that are not identified here.

PART D: Certification Regarding Drug-Free Workplace Requirements

CHECK___IF THIS CERTIFICATION IS FOR AN APPLICANT WHO IS AN INDIVIDUAL.

Alternate II. (Grantees Who Are Individuals)

(a) The grantee certifies that, as a condition of the grant, he or she will not engage in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance in conducting any activity with the grant;

(b) If convicted of a criminal drug offense resulting from a violation occurring during the conduct of any grant activity, he or she will report the conviction, in writing, within 10 calendar days of the conviction, to the grant officer or other designee, unless the Federal agency designates a central point for the receipt of such notices. When notice is made to such a central point, it shall include the identification number(s) of each affected grant.

DI-2010
June 1995
(This form replaces DI-1953, DI-1954, DI-1955, DI-1956 and DI-1953)

PART E: Certification Regarding Lobbying
Certification for Contracts, Grants, Loans, and Cooperative Agreements

CHECK_X_ IF CERTIFICATION IS FOR THE AWARD OF ANY OF THE FOLLOWING AND THE AMOUNT EXCEEDS $100,000: A FEDERAL GRANT OR COOPERATIVE AGREEMENT; SUBCONTRACT, OR SUBGRANT UNDER THE GRANT OR COOPERATIVE AGREEMENT.

CHECK___ IF CERTIFICATION FOR THE AWARD OF A FEDERAL LOAN EXCEEDING THE AMOUNT OF $150,000, OR A SUBGRANT OR SUBCONTRACT EXCEEDING $100,000, UNDER THE LOAN.

The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, and officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

As the authorized certifying official, I hereby certify that the above specified certifications are true.

SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL

Hardy Dhillon, Contract and Grant Officer

TYPED NAME AND TITLE

4/15/99

DATE

DI-2010
June 1988
(This form replaces DI-1953, DI-1954, DI-1955, DI-1956 and DI-1963)

I —0 1 3 4 7 9

OMB Approval No. 0348-0043

APPLICATION FOR FEDERAL ASSISTANCE

2. DATE SUBMITTED	Applicant Identifier
3. DATE RECEIVED BY STATE	State Applicant Identifier
4. DATE RECEIVED BY FEDERAL AGENCY	Federal Identifier

1. TYPE OF SUBMISSION

Application	*Preapplication*
☐ Construction	☐ Construction
☒ Non-Construction	☐ Non-Construction

5. APPLICANT INFORMATION

Legal Name: The Regents of the University of California

Organizational Unit: Organismic Bio., Ecology & Evolution

Address *(give city, county, state, and zip code)*:
Box 951406
1400 Ueberroth
Los Angeles, Ca. 90095-1406

Name and telephone and E-mail number of the person to be contacted on matters involving this application *(give area code)*
Hardy Dhillon, (310) 825-0965; hdhillon@smnet.ucla.edu

6. EMPLOYER IDENTIFICATION NUMBER (EIN):
9 5 - 6 0 0 6 1 4 3

7. TYPE OF APPLICANT: *(enter appropriate letter in box)* ☐

A. State
B. County
C. Municipal
D. Township
E. Interstate
F. Intermunicipal
G. Special District
H. Independent School Dist.
I. State Controlled Institution of Higher Learning
J. Private University
K. Indian Tribe
L. Individual
M. Profit Organization
N. Other (Specify) _____

8. TYPE OF APPLICATION:
☒ New ☐ Continuation ☐ Revision

If Revision, enter appropriate letter(s) in box(es): ☐ ☐
A. Increase Award B. Decrease Award C. Increase Duration
D. Decrease Duration Other *(specify)*:

9. NAME OF FEDERAL AGENCY:
U.S. Department of the Interior

10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER: ☐☐.☐☐☐
TITLE: CALFED Bay-Delta program

11. DESCRIPTIVE TITLE OF APPLICANT'S PROJECT:
Behavior of Anadromous Fishes at Passageways

12. AREAS AFFECTED BY PROJECT *(cities, counties, states, etc.)*:
Sonoma and Sacramento Counties

13. PROPOSED PROJECT:

Start Date	Ending Date
10/01/99	09/30/02

14. CONGRESSIONAL DISTRICTS OF:

a. Applicant	b. Project
29th	6th and 11th

15. ESTIMATED TOTAL PROJECT FUNDING:

a. Federal	$	115,857 .00
b. Applicant	$	21,945 .00
c. State	$	.00
d. Local	$	.00
e. Other	$	.00
f. Program Income	$	.00
g. TOTAL	$	137,802 .00

16. IS APPLICATION SUBJECT TO REVIEW BY STATE EXECUTIVE ORDER 12372 PROCESS?
a. YES. THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON:
DATE _____
b. NO. ☒ PROGRAM IS NOT COVERED BY E.O. 12372
☐ OR PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW

17. IS THE APPLICANT DELINQUENT ON ANY FEDERAL DEBT?
☐ Yes If "Yes," attach an explanation. ☒ No

18. TO THE BEST OF MY KNOWLEDGE AND BELIEF, ALL DATA IN THIS APPLICATION/PREAPPLICATION ARE TRUE AND CORRECT. THE DOCUMENT HAS BEEN DULY AUTHORIZED BY THE GOVERNING BODY OF THE APPLICANT AND THE APPLICANT WILL COMPLY WITH THE ATTACHED ASSURANCES IF THE ASSISTANCE IS AWARDED.

a. Typed Name of Authorized Representative	b. Title	c. Telephone number
Hardy Dhillon	Contract and Grant Officer	(310) 825-0695

d. Signature of Authorized Representative

e. Date Signed
4/15/99

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Standard Form 424 (Rev. 7-97)
Prescribed by OMB Circular A-102

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OMB Approval no. 0348-0044

Standard Form 424A
BUDGET INFORMATION - Non-Construction Programs

SECTION A - BUDGET SUMMARY

Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1. Task I				56,785	3,511	60,296
2. Task II				59,072	7,461	66,533
3. Task III						
4. Task IV						
5. TOTALS	N/A			115,857	10,972	126,829

SECTION B - BUDGET CATEGORIES

6. OBJECT CLASS CATEGORIES	GRANT PROGRAM, FUNCTION OR ACTIVITY (1) Task I	(2) Task II	(3) Task III	(4) Task IV	Total (5)
a. Personnel	25,703	31,362	0	0	57,065
b. Fringe Benefits	4,370	5,332	0	0	9,702
c. Travel	1,003	5,522	0	0	6,525
d. Equipment	16,500	0	0	0	16,500
e. Supplies	380	2,067	0	0	2,447
f. Contractual					
g. Construction					
h. Other	517	2,599	0	0	3,116
i. Total direct Charges (sum of 6a-6h)	48,473	46,882	0	0	95,355
j. Indirect Charges	8,313	12,189	0	0	20,502
k. TOTALS (sum of 6i and 6j)	56,786	59,071	0	0	115,857
7. PROGRAM INCOME	0	0	0	0	0

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SECTION C - NON FEDERAL RESOURCES

(a) Grant Program	(b) Applicant	(c) State	(d) Other Sources	(e) TOTALS
8. Task I	3,511			3,511
9. Task II	7,461			7,461
10. Task III	0			0
11. Task IV	0			0
12. TOTALS (sum of lines 8 and 11)	21,945			21,945

SECTION D - FORECASTED CASH NEEDS

	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
13. Federal	115,857	28,846	27,939	29,536	29,536
14. NonFederal	21,945	5,486	5,486	5,486	5,486
15. TOTAL (sum of lines 13 and 14)	137,802	34,332	33,425	35,022	35,022

SECTION E - BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT

(a) Grant Program	FUTURE FUNDING PERIODS (YEARS) (b) First	(c) Second	(d) Third	(e) Fourth
16. Task I	0	0		
17. Task II	59,337	0		
18. Task III	61,112	89,874		
19. Task IV	0	24,590		
20. TOTALS (sum of lines 16 - 19)	120,449	114,464		

SECTION F - OTHER BUDGET INFORMATION

(Attach additional Sheets if Necessary)

21. Direct Charges:	22. Indirect Charges:

23. Remarks:

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ASSURANCES—NON-CONSTRUCTION PROGRAMS

Note: Certain of these assurances may not be applicable to your project or program. If you have questions please contact the awarding agency. Further, certain Federal awarding agencies may require applicants to certify to additional assurances. If such is the case, you will be notified.

As the duly authorized representative of the applicant I certify that the applicant:

1. Has the legal authority to apply for Federal assistance, and the institutional, managerial and financial capability (including funds sufficient to pay the non-Federal share of project costs) to ensure proper planning, management and completion of the project described in this application.

2. Will give the awarding agency, the Comptroller General of the United States, and if appropriate, the State, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to the award; and will establish a proper accounting system in accordance with generally accepted accounting standards or agency directives.

3. Will establish safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain.

4. Will initiate and complete the work within the applicable time frame after receipt of approval of the awarding agency.

5. Will comply with the Intergovernmental Personnel Act of 1970 (42 U.S.C. §§ 4728-4763) relating to prescribed standards for merit systems for programs funded under one of the nineteen statutes or regulations specified in Appendix A of OPM's Standards for a Merit System of Personnel Administration (5 C.F.R. 900, Subpart F).

6. Will comply with all Federal statutes relating to nondiscrimination. These include but are not limited to: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin; (b) Title IX of the Education Amendments of 1972, as amended (20 U.S.C. §§ 1681-1683, and 1685-1686), which prohibits discrimination on the basis of sex; (c) Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. § 794), which prohibits discrimination on the basis of handicaps; (d) the Age Discrimination Act of 1975, as amended (42 U.S.C. §§ 6101-6107), which prohibits discrimination on the basis of age; (e) the Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255), as amended, relating to nondiscrimination on the basis of drug abuse; (f) the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970 (P.L. 91-616), as amended, relating to nondiscrimination on the basis of alcohol abuse or alcoholism; (g) §§ 523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. 290 dd-3 and 290 ee-3), as amended, relating to confidentiality of alcohol and drug abuse patient records; (h) Title VIII of the Civil Rights Act of 1968 (42 U.S.C. § 3601 et seq.), as amended, relating to non-discrimination in the sale, rental or financing of housing; (i) any other nondiscrimination provisions in the specific statute(s) under which application for Federal assistance is being made; and (j) the requirements of any other nondiscrimination statute(s) which may apply to the application.

7. Will comply, or has already complied, with the requirements of Titles II and III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646) which provide for fair and equitable treatment of persons displaced or whose property is acquired as a result of Federal or federally assisted programs. These requirements apply to all interests in real property acquired for project purposes regardless of Federal participation in purchases.

8. Will comply with the provisions of the Hatch Act (5 U.S.C. §§ 1501-1508 and 7324-7328) which limit the political activities of employees whose principal employment activities are funded in whole or in part with Federal funds.

9. Will comply, as applicable, with the provisions of the Davis-Bacon Act (40 U.S.C. §§ 276a to 276a7), the Copeland Act (40 U.S.C. § 276c and 18 U.S.C. §§ 874), and the Contract Work Hours and Safety Standards Act (40 U.S.C. §§ 327-33.3), regarding labor standards for federally assisted construction subagreements.

10. Will comply, if applicable, with flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973 (P.L. 93234) which requires recipients in a special flood hazard area to participate in the program and to purchase flood insurance if the total cost of insurable construction and acquisition is $10,000 or more.

11. Will comply with environmental standards which may be prescribed pursuant to the following: (a) institution of environmental quality control measures under the National Environmental Policy Act of 1969 (P.L. 91-190) and Executive Order (EO) 11514; (b) notification of violating facilities pursuant to EO 11738; (c) protection of wetlands pursuant to EO 11990; (d) evaluation of flood hazards in floodplains in accordance with EO 11988; (e)assurance of project consistency with the approved State management program developed under the Coastal Zone Management Act of 1972 (16 U.S.C. §§ 1451 et seq.); (f) conformity of Federal actions to State (Clear Air) Implementation Plans under Section 176(c) of the Clear Air Act of 1955, as amended (42 U.S.C. § 7401 et seq.); (g) protection of underground sources of drinking water under the Safe Drinking Water Act of 1974, as amended, (P.L. 93-523); and (h) protection of endangered species under the Endangered Species Act of 1973, as amended, (P.L. 93-205).

12. Will comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. §§ 1271 et seq.) related to protecting components or potential components of the national wild and scenic rivers system.

13. Will assist the awarding agency in assuring compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. 470), EO 11593 (identification and protection of historic properties), and the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. 469a-1 et seq.).

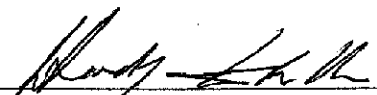
14. Will comply with P.L. 93-348 regarding the protection of human subjects involved in research, development, and related activities supported by this award of assistance.

15. Will comply with the Laboratory Animal Welfare Act of 1966 (P.L. 89-544, as amended, 7 U.S.C. 2131 et seq.) pertaining to the care, handling, and treatment of warm blooded animals held for research, teaching, or other activities supported by this award of assistance.

16. Will comply with the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. §§ 4801 et seq.) which prohibits the use of lead based paint in construction or rehabilitation of residence structures.

17. Will cause to be performed the required financial and compliance audits in accordance with the Single Audit Act of 1995 or OMB Circular No. A-133, Audits of Institutions of Higher Learning and other Non-profit Institutions.

18. Will comply with all applicable requirements of all other Federal laws, executive orders, regulations and policies governing this program.

SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL	TITLE
	Hardy Dhillon Contract and Grant Officer
APPLICANT ORGANIZATION	DATE SUBMITTED
The Regents of the University of California Box 951406, 1401 Ueberroth Los Angeles, CA 90095-1406	4/15/99

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